SECTION D1000tg – TECHNICAL GUIDE

CONVEYING SYSTEMS
04/02

PART 1 - GENERAL

Provide Y2K compliant Computer Controlled Facility Components (CCFC) for systems specified in this section. CCFC shall have software driven technology and embedded microchip technology and shall include any facility control system utilizing a microcomputer, minicomputer, or programmable logic controller. Y2K compliant, by definition, means "Computer Controlled Facility Components that accurately process date and time data, including but not limited to, calculating, comparing, and sequencing from, into, and between the twentieth and twenty-first centuries, and the years 1999 and 2000 and leap year calculations." The design and construction of Conveying Systems required by this performance specifications section shall clearly identify and describe CCFC compliant equipment.

1.1 CONVEYING SYSTEMS DESCRIPTION

Conveying Systems shall include hydraulically operated, electrically operated, passenger and/or freight elevators, furnished and installed, complete and operational, including all parts, labor and materials, equipment, controls, hardware, software, fastening to adjacent building systems, testing and demonstration, in accordance with the minimum criteria described in this Technical Guide.

1.2 CONVEYING SYSTEMS REQUIREMENTS

The Design-Build Contractor's Architect/Engineer of Record shall demonstrate that Conveying Systems are in compliance with the following minimum Conveying Systems Requirements:

1.2.1 Design, construction, operation and maintenance of elevators, accessories, and supporting systems have been thoroughly coordinated with all other related building systems, including:

a. Location of machinery and controls in machine room.

b. Details of conveying systems materials and equipment, including but not limited to operating and signal fixtures, doors, door and car frames, car enclosures, controllers, motors, guide rails and brackets, layout of hoistway in plan and elevation, and other layout information and clearance dimensions.

c. Comprehensive wiring diagrams and sequence of operations, showing electrical connections and functions of all elevator systems for the machine room, hall signals and the hoistway.

1.3 CONVEYING SYSTEMS DESIGN AND CONSTRUCTION CRITERIA

Design and Construction of Conveying Systems shall be in accordance with:

a. For all elevators and escalators:

ASME/ANSI A17.1(1996; addenda 1997) Safety Code for Elevators and Escalators

NAVFAC Elevator Design Guide – This guide can be found at the following web address:

http://www.efdlant.navfac.navy.mil/lantops_15/

ATBCB ADA Title III (1990), Americans With Disabilities ACT- Buildings and Facilities

TI 809-04, Seismic Design For Buildings

NFPA 101 Life Safety Code (1997)

NFPA 70 (1999) National Electric Code

NFPA 13 Installation of Sprinkler Systems (1996)

b. For hydraulically operated elevators: ASME/ANSI A17.2.2 (1997) Inspectors Manual for Hydraulic Elevators

c. For electrically operated elevators: ASME/ANSI A17.2.1(1996) Inspectors Manual for Electric Elevators

1.4 COMPLIANCE VERIFICATION

Compliance with these requirements will be determined during over-the-shoulder review of design and construction submittals presented by the Design-Build Contractor and his Architect/Engineer of Record, by periodic field inspection, and by systems acceptance testing.

1.5 DESIGN SUBMITTALS

1.5.1 Design Analyses and Drawings

Design Analysis and Drawing Submittal requirements shall be as described in the RFP for each individual project. See Section 00911 – “Design Requirements”.

1.5.2 Design Specifications

Design Specifications Submittal requirements shall be as described in the RFP for each individual project. See Section 00911 – “Design Requirements”.

1.6 CONSTRUCTION SUBMITTALS

Construction Submittal requirements shall be as described in the RFP for each individual project. See Section 01330 – “Submittal Procedures”.

1.7 QUALITY ASSURANCE

The Design-Build Contractor’s Architect/Engineer of Record shall demonstrate that he/she has reviewed Construction Submittals to assure that the following actions have been completed with respect to Conveying Systems:

1.7.1 Manufacturer and Installers Qualifications

Conveyance Systems shall be pre-engineered elevator systems furnished and installed by manufacturers and installers regularly engaged in the manufacture and installation of elevator systems. Manufacturers shall either install elevator system or shall provide letter of endorsement certifying that installer is acceptable to manufacturer prior to commencement of the installation. Installer shall be a contractor who has been regularly engaged in installation and maintenance of elevator systems.

1.7.2 Data Requirements

Prior to installation of conveyance systems, manufacturer’s and installer’s shop drawing documentation has been reviewed by the Design-Build Contractor’s Architect/Engineer of Record for compliance with the requirements of the Contract. Shop Drawing documentation shall include at a minimum information on motor type and size, pump type and size, gages, pistons and cylinders, piping and valves, hall station

equipment, and buffer on elevators and accessories. For elevator supporting systems, include information on car control systems. On data sheets, provide document identification number or bulletin number, published or copyrighted prior to the date of contract award.

1.7.3 Drawing Requirements

Prior to installation of conveyance systems, manufacturer's and installer's shop drawing documentation has been reviewed by the Design-Build Contractor's Architect/Engineer of Record for compliance with the requirements of the Contract. Show assembly and arrangement of elevators, accessories, and supporting systems. Show location of machinery and controls in machine room. Provide details for materials and equipment, including but not limited to operating and signal fixtures, doors, door and car frames, car enclosure, controllers, motors, guide rails and brackets, layout of hoistway in plan and elevation, and other layout information and clearance dimensions. Submit complete wiring diagrams and sequence of operations, showing electrical connections and functions of elevator systems, for machine rooms, halls, and hoistway areas. Submit one set of wiring diagrams in plastic or glass cover, framed and mounted in elevator machine room. Deliver other sets to Contracting Officer. Coded diagrams are not acceptable unless adequately identified.

1.7.4 Design Data: Reaction Load Data Requirements

Prior to installation of conveyance systems, manufacturer's and installer's shop drawing documentation has been reviewed by the Design-Build Contractor's Architect/Engineer of Record with respect to reaction loads imposed on other building systems by the elevator system. Demonstrate that calculations have been prepared complying with ASME A17.1, Appendix F. Demonstrate that calculations have been certified by licensed structural engineer.

1.7.5 Design Data: Heat Load Data Requirements

Prior to installation of conveyance systems, manufacturer's and installer's shop drawing documentation has been reviewed by the Design-Build Contractor's Architect/Engineer of Record with respect to manufacturer's calculations for total anticipated heat loads that will be generated by all of the elevator machine room equipment. Demonstrate that calculations have been prepared by and certified by a licensed mechanical engineer.

1.7.6 Certificates: Welders' Requirements

Comply with AWS D1.1, Section 5. Include certified copies of welders' qualifications. List welders' names with corresponding code marks to identify each welder's work.

1.8 CERTIFIED ELEVATOR INSPECTOR'S QUALIFICATION

Ninety days prior to completing elevator system installation, notify the Contracting Officer that the elevator system will be ready for final inspection and acceptance testing. The Contracting Officer will arrange for the services of a Naval Facilities Engineering Command certified elevator inspector who will conduct the elevator final inspection and acceptance testing.

The Government may elect to include elevator and inspection services in the Contract. Under those circumstances the Contractor shall obtain the services of a certified elevator inspector to inspect and witness performance testing of the elevator. The inspector shall meet qualifications requirements listed in ASME/ANSI QEI-1 and shall be certified by an organization accredited by ASME in accordance with ASME/ANSI QEI-1.

All systems shall be operated to demonstrate compliance with contract requirements. Return trips to witness repeat acceptance tests due to failure of previous tests will be at the contractor's expense for time and travel.

1.9 NEW INSTALLATION SERVICE

The Design-Build Contractor shall provide routine warranty service in accordance with manufacturer's warranty requirements for period of not less than 12 months after date of acceptance of the entire project by Contracting Officer, unless designated otherwise in the Contract. Warranty work shall be performed during regular working hours. However, warranty shall include 24-hour emergency service, with 1 hour response time, during this period without additional cost to Government. Warranty service shall include adjustments, greasing, oiling, and cleaning, and shall provide routine inspection and tests of elevators in accordance with ASME A17.1 (Sections 1004 and 1005) and ASME/ANSI A17.2.1 or A17.2.2 as applicable. Warranty service shall provide all supplies and parts needed to keep elevator systems in proper operation. Warranty service shall be performed only by factory trained personnel.

1.9.1 Maintenance and Diagnostic Tools

Provide all special tools and software necessary to service and maintain each elevator; deliver at time of final acceptance. Provide one of each tool per group of elevators.

1.9.2 Keys for Elevator Key Switches

For each group of elevators, provide a minimum of twelve keys per unique cylinder used on all key switches for single elevator. If the project includes more than one elevator, additional keys are not required unless there are additional unique cylinders. Keys shall be provided with brass or fiberglass tags marked 'PROPERTY OF THE U. S. GOVERNMENT' on one side and with the function of key or approved code number on other side.

1.10 MAINTENANCE

1.10.1 Maintenance and Repair Action Plan

Provide plan of action by the Elevator Installation Contractor to provide emergency and routine maintenance in accordance with paragraph entitled "New Installation Service". In addition to data package "Operation and Maintenance Data", provide a telephone number list, personnel contacts, and all tools to be provided to the Contracting Officer.

PART 2 SYSTEM COMPONENTS

2.1 ELEVATORS (D010)

Provide elevator that complies with ASME A17.1 and ASME A17.2.1 or A17.2.2, as applicable, in its entirety, and in accordance with additional requirements specified herein.

2.1.1 Passenger Elevators

The Design-Build Contractor’s Architect/Engineer of Record shall obtain the services of an elevator consultant to perform a traffic analysis and also to conduct interviews with the user to determine the following:

a. Typical number of personnel & type of freight
b. Rated load
c. Rated speed
d. Travel length
e. Number of stops
f. Number of hoistway Openings
g. Car platform, car inside, and car door opening dimensions
h. Car Door Types

2.1.1.1 Cab Enclosures and Door Finishes

Provide finishes as described in the Performance Specifications Sections of the Request for Proposals for each individual project.

2.1.2 Freight Elevators

The Design-Build Contractor's Architect/Engineer of Record shall obtain the services of an elevator consultant to perform a traffic analysis and also to conduct interviews with the user to determine the following:

a. Typical freight
b. Rated load
c. Rated speed
d. Travel length
e. Number of stops
f. Number of hoistway Openings
g. Car platform, car inside, and hoistway door opening dimensions
h. Hoistway Door Types
i. Car gate type
j. Loading type -Class A, B, C

2.1.2.1 Cab Enclosures and Door Frame Finishes

Provide finishes as described in the Performance Specifications Sections of the Request for Proposals for each individual project.

2.2 SPECIAL OPERATION AND CONTROL

Provide all special operations and control systems in accordance with ASME A17.1. Provide special operation key switches with removable cores.

2.2.1 Firefighters' Service

Comply with ASME A17.1, Section 211, Rule 211.3. Provide equipment and signaling devices.

2.2.2 Smoke Detectors

Smoke detectors are specified in Section D4000, "FIRE PROTECTION SYSTEMS PERFORMANCE SPECIFICATIONS", including conduit and wiring from each smoke detector to elevator machinery room control panel. Ensure that all smoke detectors are mounted on finished ceiling. Smoke detector system shall comply with ASME A17.1.

2.2.3 Fire Sprinklers

a. Dual contact flow switch, check valve, and shutoff valve in sprinkler lines serving elevator machine rooms and hoistways are described under Section D4000 in accordance with ASME/ANSI A17.1. Wiring and conduit from the flow switch to the fire alarm control panel are described under Section D5000.

b. Under this elevator work section, provide shunt-trip equipped mainline disconnect switch for each elevator within machine room. Also provide wiring and conduit from each flow switch's auxiliary alarm contacts to the respective disconnect switch under this section. Upon flow of water, flow switch shall instantaneously send signal to shunt-trip(s) and cause opening of shunt-trip equipped mainline disconnect switches, in compliance with ASME/ANSI A17.1.

c. Machine Room: Indicate a supervised shut-off valve, check valve, flow switch, and test valve in the sprinkler line feeding the machine room. These items shall be located outside of and adjacent to the machine room. Actuation of the flow switch shall remove power to the elevator by shunt trip breaker operation (flow switch shall not have a time delay feature). Coordinate with Building Electrical Systems.

d. Elevator Pit: Provide a sprinkler in the pit for hydraulic elevators. Locate the sprinkler head no more than 2'-0" (609 mm) above the pit floor. Provide a supervised shut-off valve in the sprinkler line feeding the pit. Locate the valve outside of and adjacent to the pit. Actuation of the pit sprinkler shall not remove power to the elevator by shunt trip breaker operation.

e. Elevator Hoistway: Provide a sprinkler at the top of the hoistway for hydraulic elevators with cylinder or supply piping extending above the second finished floor elevation. Provide a supervised shut-off valve, check valve, flow switch, and test valve in the sprinkler line feeding the hoistway. These items shall be located outside of and adjacent to the hoistway. Actuation of the flow switch shall remove power to the elevator by shunt trip breaker operation (flow switch cannot have a time delay feature).

f. Test Valve: Provide inspector's test connection for each flow switch associated with the elevator machine room and/or elevator hoistway sprinklers. Test connection shall be located outside rated enclosures. Locate test connection piping in a place immediately above a drain location that can accept full flow and where water may be discharged without property damage. Discharge to a floor drain shall be permitted only if the drain is sized to accommodate full flow. Discharge to janitor sinks or similar plumbing fixtures shall not be permitted.

2.2.4 Independent Service

Provide an exposed key-operated switch in car operating panels to enable independent service and simultaneously disable in-car signals and landing-call responses.

2.2.5 FIRE EXTINGUISHER

Provide a fire extinguisher inside the machine room, on the strike side of the machine room door.

2.3 ELEVATOR DRIVE SYSTEM (HYDRAULIC)

Provide hydraulic pump unit, piping, cylinder/piston assembly, and rated equipment in accordance with ASME A17.1, which will operate at a maximum working pressure of less than 2756 kPag (400 psig).

2.3.1 Hydraulic Pump Unit

Provide self-contained unit including oil-hydraulic elevator pump, electric motor, drive assembly, oil strainer in suction line, structural steel outer base with tank and supports, oil-tight drip pan, and inner pump-mounting base. Limit acoustic output of elevator machine to 80 dBA. Provide sound-insulating panels to isolate airborne noise from non oil-immersed pump-motor assembly. Provide blowout-proof muffler, containing pulsation-absorbing materials in oil line between pump unit and jack. Provide ventilation to cool power unit. Provide excess tank capacity of at least 38 liters (10 gallons). Finish ferrous surfaces with rust-inhibiting paint.

2.3.2 Hydraulic Controls and Equipment

Comply with ASME A17.1, Sections 303 and 304. Provide electrically operated "UP" valve, constant velocity "DOWN" valve, "UP" and "DOWN" leveling valves, "BYPASS UPON STARTING" valve, check valve, vacuum relief valve, automatic shutoff (rupture) valve, safety relief valve, manually operated lowering valve.

2.3.2.1 Piping and Accessories

Comply with ASTM A 53 or ASTM A 106. Provide Schedule 80, black steel piping with ASME B16.9 and ASME B16.11 fittings. Schedule 80 piping shall extend from the pump control valve body, inside the pump unit, to the hydraulic cylinder in the hoistway. Provide dielectric union at each end of the pump to the cylinder pipe run. Provide hangers or supports for all piping.

2.3.2.2 Low Oil Condition

Provide device for each elevator to protect pumping equipment in event oil level is too low. When device operates, it shall stop pump and motor and cause car to descend to lowest landing, open car doors and cease elevator operation except for door control circuits. Provide illuminating indicator on machine room control panel to alert of low oil condition.

2.3.2.3 Oil Temperature Device

Provide means to maintain oil temperature between 15 and 38 degrees C (60 and 100 degrees F) regardless of ambient temperature.

2.3.3 Cylinder-Plunger Unit

Provide a direct plunger type hydraulic elevator. Provide a piston of single-piece seamless steel construction. Provide stop plate or ring welded to bottom of the piston. Provide packing and wiper (drip) ring with outlet for connection to the scavenge oil reservoir to collect leakage oil from cylinder for either inspecting for contamination or returning to tank. Use only standard packing glands with bolts that compress packing. Provide threaded 6 mm (1/4 inch) bleeder valve at top of cylinder just below packing gland. Roped hydraulic or telescopic cylinder-plunger units are not acceptable.

2.3.4 Cylinder Protection

Protect the cylinder with a pipe-manufacturer applied Applied Extruded Coating(AEC). The AEC coating application process shall include the following steps as a minimum: blast clean the bare pipe exterior surfaces to white metal, apply a minimum of 0.25 mm (0.010 inch) undercoating of heated butyl rubber adhesive; and apply a minimum of one mm (0.040 inch) thickness overcoating of polyethylene, hot extruded over the undercoating. The overcoating shall be free of surface blemishes, cracks, voids, and contamination from foreign substances. Field pipe joints and coating repairs shall be field applied coatings covered with heat-shrinkable pipe sleeves, following the cylinder manufacturer's instructions. Protect the AEC coating from damage until the cylinder is set into the cylinder well, plumbed, and aligned.

2.3.5 Automatic Shutoff Valve

Provide automatic shut-off valve in oil supply line as close to cylinder inlet as possible. When there is a ten percent drop in NO-LOAD operating pressure, an automatic shut-off valve shall be activated. When activated, the device shall immediately stop descent of the elevator and hold elevator until lowered by use of a manual lowering feature of the valve. Arrange the manual lowering feature of automatic shut-off valve to limit descending speed of the elevator to 0.10 meters per second (20 feet per minute). Exposed adjustments of automatic shut-off valve shall have means of adjustment sealed by certified elevator inspector after being set to correct position and successfully tested.

2.3.6 Cylinder Well System

Shall consist of a well casing and a liner.

2.3.6.1 Well Casing

Well for hydraulic cylinder shall be drilled and shall provide adequate depth for proper elevator equipment operation. Line well with continuous steel casing with minimum wall thickness of 6 mm (0.25 inch), and minimum inside diameter of not less than 125 mm (5 inches) larger than PVC liner maximum outside diameter, including cap and couplings. Close bottom of well casing with steel plate at least twice as thick as casing wall thickness, welded continuously all around, prior to insertion into well, or close well casing bottom by plugging with minimum of 150 mm (6 inches) of concrete, embedding casing bottom at least 50 mm (2 inches) but not more than 100 mm (4 inches) into the wet concrete. Install cylinder well casing not more than 25 mm (one inch) out of plumb over entire length. Backfill the well outside of the casing with fine, dry, salt-free sand, as required to maintain casing straight and plumb, or backfill with bentonite grout if more than one water-bearing strata are penetrated by well. Maintain well casing pumped dry throughout remaining installation of elevator.

2.3.6.2 PVC Liner

Provide Schedule 80 PVC pipe liner with bottom cap and couplings; joints shall be sealed watertight using PVC pipe manufacturer's recommended adhesive or heat welding methods. Liner inside diameter shall be not less than 76 mm (3 inches) larger than elevator cylinder maximum outside diameter. Set PVC liner into well casing, centered and plumb. Securely locate PVC liner bottom end within well casing with fine, dry, salt free sand.

2.3.6.3 Pressure Test

Install pressure test cap onto PVC liner, equipped with at least: a safety relief valve set to relieve at 205 kPag (30 psig); a 114 mm (4.5 inches) diameter dial pressure gage scaled for 0 to 690 kPag (0 to 100 psig) and calibrated to 0.5 percent accuracy; and an air pressure admission throttling and shutoff valve. Perform air pressure test by filling PVC liner with water and slowly admitting dry compressed air to pressurize PVC liner to 69 kPag (10 psig). Shut off air supply at throttle/shutoff valve, disconnect compressed air source, observe and record air pressure in PVC liner every 5 minutes for not less than 30 minutes. Liner shall not allow drop in air pressure in excess of one kPag (0.5 psig) over the 30 minute test period. Perform test in presence of ROICC and/or NAVFAC certified elevator inspector. Upon satisfactory completion of pressure test, remove test cap and dry interior of PVC liner. Upon failure of test, remove, repair, reinstall, and retest PVC liner until satisfactory. For safety, pressure test shall only be performed when liner is fully inserted in the well casing and well.

2.3.6.4 Cylinder Installation

Remove surface moisture from inside of liner by wiping with dry cloth or purging with warm dry air prior to installing elevator cylinder. Install cylinder. Provide elevator manufacturer's recommended supports under cylinder head and attach cylinder head supports to cylinder and pit support channels in accordance with elevator manufacturer's instructions. Set cylinder into the pit, plumb and level in accordance with elevator manufacturer's instructions.

2.3.6.5 Casing Fill

Following cylinder installation, fill the space between PVC liner and steel casing with fine, dry, salt-free sand in 610 mm (24 inch) lifts with tamping between each lift. Continue filling with sand up to the level at the pit floor seal.

2.3.6.6 Liner Inspection and Test Tube

Provide a 19 mm (3/4 inch) PVC test tube with strainer located within 152 mm (6 inch) of bottom of liner. Strainer shall exclude sand and admit air, water or oil. Provide top of test tube with removable cap to exclude foreign matter.

2.3.6.7 Cylinder Bottom Location Fill

At the option of the contractor, clean dry sand may be used up to and not more than 610 mm (24 inches) above the bottom of the cylinder, to stabilize the cylinder. Remainder of the liner shall be empty.

2.3.6.8 Seal

Seal gap between cylinder and PVC liner and gap between liner and well casing with foam insert strong enough to retain and support final grouting. Provide 21 MPa (3000 psi) grout to a minimum of 102 mm (4 inch) thickness and level top of final grouting with pit floor. Test assembled PVC liner and elevator cylinder system with 21 kPag (3 psig) air, equivalent to test in paragraph entitled "Pressure Test" to ensure integrity of final PVC liner system. Repair if necessary.

2.3.6.9 Containment

Protect portions of hydraulic elevator oil supply line that are installed below ground, encapsulated in concrete, or covered by construction, with continuous Schedule 80 PVC containment system, extending from machine room to elevator cylinder head connection. Coat and wrap line similar to elevator cylinder. Cap and seal containment system annular space.

2.3.7 Motors

Shall comply with NEMA MG 1. Provide squirrel cage, induction motors with drip-proof enclosure, continuous rated, maximum 1800 rpm, and Class F insulation rated at 120 starts per hour.

2.3.7.1 Insulation Resistance and Motor Nameplate Data

Provide minimum of one megohm insulation resistance between conductors and motor frame. Provide motor nameplate listing rated wattage (horsepower), speed, and ampere, permanently mounted in position visible to viewer without use of special tools, such as a mirror. Provide motor and pump data on the outside of machine frame.

2.3.7.2 Maximum Allowable Motor Amperage

When motor is running and elevator is lifting rated load at rated speed, motor shall not exceed its own nameplate amperage.

2.4 ELEVATOR MACHINE (ELECTRIC)

Comply with ASME A17.1, Section 208, geared, worm geared or gearless traction, direct-drive machines.

2.4.1 Corrosion Protection

Paint or finish ferrous surfaces with minimum one coat of rust-inhibiting paint conforming to manufacturer's standard practice.

2.4.2 Drive Motor

Comply with NEMA MG 1, Part 18, drive motor with Class F insulation, and rated for starting, stopping, and speed of elevator.

2.5 CONTROL EQUIPMENT

2.5.1 Motor Controller (Hydraulic Elevators)

Comply with NFPA 70 and ASME A17.1, Section 306. Provide elevator motor controller of magnetic reduced-voltage resistance or wye-delta start with overload relays in each line and reverse phase relay. Provide controls for sequential starting, stopping, and speed of elevator and to give specified operation. Enclose control equipment in factory-primed and baked-enamel coated sheet-metal cabinets with removable or hinged doors and ventilation louvers.

2.5.2 Motor Controller (Electric Elevators)

Comply with ASME A17.1, Section 210. Provide variable voltage with silicon controlled rectifier (SCR), or variable-frequency alternating current (ac) drive control. Enclose control equipment in factory-primed and baked-enamel coated sheet-metal cabinets with removable or hinged doors with ventilation louvers.

2.5.2.1 SCR Control or Variable Voltage Variable Frequency (VVVF) AC Control

Provide individual isolation transformers and individual choke reactors for each individual hoist motor. Provide filtering to maintain harmonic distortion below IEEE standards as measured at the elevator machine room disconnect.

2.5.3 Logic Control

Provide solid-state microprocessor controller to enable programmable control of call allocation, logic functions, door control, speed sensing and car position. Provide a method of reprogramming adjustable parameters of computerized controls. Store all programming in non-volatile memory. The microprocessor control system is acceptable only if hardware and software required to maintain and utilize microprocessor is provided and training is provided to Government Personnel by the equipment manufacturer and supplier.

2.5.3.1 Repair Requirements

For the repair of microprocessor control system, provide maintenance tools, supporting computer software, and software documentation required for complete maintenance of elevator system including diagnostics and adjustments. Tools may be hand held or built into control system. Provide tools which do not require recharging to maintain their memory or authorization for use. Do not use software which requires periodic reprogramming, or reauthorization. Programs shall be stored in non-volatile memory. Tools and software may be factory programmed to operate only with this project's identification serial number.

2.5.4 Automatic Operation

Using the results of the traffic analysis, provide Single Two-Stop Automatic Operation, Selective Collective Automatic Operation, Duplex Selective Collective Automatic Operations, or Group Automatic Operation.

2.5.5 Self-Leveling and Anti-Creep Device

Comply with ASME A17.1, Rule 306.3. Provide each elevator with a two-way, automatic self-leveling device that brings car floor to within 6 mm (1/4 inch) of level with floor landing regardless of load, position of hoistway door, or direction of travel.

2.6 OPERATING PANELS, SIGNAL FIXTURES, AND COMMUNICATIONS CABINETS

2.6.1 Car and Hall Buttons

Provide recessed tamper-proof push buttons of minimum 20 mm (3/4 inch) size satin-finish stainless steel, with illuminated jewel center.

2.6.2 Passenger Car-Operating Panel

Comply with ASME A17.1, Section 211 and 306. Provide each car with one car operating panel that contains operation controls and communication devices. Provide exposed, flush mounted buttons for the controls that must be passenger accessible. Provide service cabinet or keyed switches for those controls that should not be passenger accessible. Allow maximum 1200 mm (48 inches) between car floor and center line of bottom button. Use engraving and backfilling or photo etching for button and switch designators. Do not use attached signs.

2.6.2.1 Passenger Controls

a. Provide illuminated operating call buttons identified to correspond to landings served by elevator car. For two openings at a floor, provide two buttons marked "FRONT" and "REAR" above button location.

b. Provide "DOOR OPEN" and "DOOR CLOSE" buttons.

c. Provide keyed "STOP" switch in accordance with ASME A17.1, rule 210.2 (v).

d. Provide "ALARM" button in compliance with UFAS, ADA, and ASME A17.1, rule 211.1. Alarm button shall be red with engraved legend "ALARM." Alarm button shall illuminate when pushed. Locate "ALARM" button at panel bottom.

e. Provide "FIRE DEPARTMENT" key switch, with "OFF-HOLD-ON" positions, in that order with key to be removable in all positions. Provide fire sign or jewel and audible signal device, in accordance with ASME A17.1, Figure 211.3a. Both visual and audible signals are activated when Phase I key switch in hall is activated or when smoke detector activates return of elevator(s) to main fire response floor. Visual and audible signal shall remain activated until car has reached designated or alternate fire response floor. Upon arrival at fire response floor visual signal remains illuminated and audible signal becomes silent.

f. Emergency two-way communication. Provide momentary pressure, single illuminating pushbutton operated communication device that complies with ASME A17.1, UFAS, and the Americans with Disabilities Act.

g. Provide Key-operated on-off "HOSPITAL EMERGENCY COMMANDEERING SERVICE" switch in medical facilities.

2.6.2.2 Service Controls

a. Provide Inspection switch that transfers car control to top-of-car inspection operating controls and prevents car operation from in-car control panel.

b. Provide independent service switch.

c. Provide car light switch, for light in car.

d. Provide fan switch, two-speed.

e. Provide 120-volt ac 60 Hz single-phase duplex electrical outlet of ground-fault-circuit-interrupt (GFCI) design.

f. Provide device for communication between car and elevator machine room.

g. Provide parking switch.

2.6.3 Freight Car-Operating Panel

2.6.4 Certificate Window

Provide 100 mm high by 150 mm wide (4 inches by 6 inches), certificate window in car operating panel for elevator inspection certificate.

2.6.5 Switches and Devices

Provide elevator manufacturer's standard grade for switches and devices on car operating panel. Legibly and indelibly identify each device and its operating positions. Locate car dispatching buttons in identical positions in car operating panels for corresponding floors.

2.6.6 In-Car Position Indicator and Signal

Provide horizontal electrical or electronic digital position indicator located minimum of 2135 mm (84 inches) above car floor. Arrange indicator to show floor position of car in hoistway and its traveling direction. Indicate position by illumination of numeral or letter corresponding to landing at which car is passing or stopping. Provide audible signal to alert passenger that elevator is passing or stopping at a floor. Provide audible signals exceeding ambient noise level by at least 20 decibels with frequency not higher than 1500 Hz.

2.6.7 Landing Position and Direction Indicator and Signal

Provide a single fixture containing the landing position and direction indicators.

2.6.7.1 Landing Position Indicator and Signal

Provide an electrical or electronic digital position indicator similar to the car position indicator. Arrange position indicator in wall horizontally above the door frame or vertically at the side of the door frame. Indicators shall show floor position of car in hoistway. Indicate position by illumination of numeral or letter corresponding to landing at which car is passing or stopping.

2.6.7.2 Landing Direction Indicator and Signal

Provide landing direction indicator with visual and audible signal devices. Provide single direction indicator at terminal floors. Provide "UP" and "DOWN" direction indicator at intermediate floors. Provide equilateral triangles not less than 65 mm (2 1/2 inches) in size, green for upward direction and red for downward direction. Provide electronic audible device that sounds once for upward direction and twice for downward direction. Provide audible signals exceeding ambient noise level by at least 20 decibels with frequency not higher than 1500 Hz.

2.7 HOISTWAY AND CAR EQUIPMENT

Comply with ASME A17.1, Parts I and II; Comply with Part III for hydraulic elevators.

2.7.1 Guide Rails and Fastenings

Comply with ASME A17.1, Section 200 and Rule 301.1. Paint rail shanks with one coat black enamel. Only T-section type rail is acceptable.

2.7.2 Pit Ladder

Shall be galvanized steel. Provide ladder in accordance with 29 CFR 1910.27 with 178 mm (7 inches) distance between rung and wall. Locate ladder on hoistway side wall closest to hoistway door opening.

2.7.3 Pit Equipment

Comply with ASME A17.1, Section 106. Provide pit channel for anchorage of main guide rail brackets and also for anchorage of counterweight guide rail brackets. Each channel shall span distance between guides. In addition, pit channel for main guide rails shall serve as mounting surface for car buffer(s). Pit channel for counterweight guide rails shall serve as mounting surface for counterweight buffer(s). Method of installation of channels, brackets and buffer mounts shall be such that pit waterproofing is not punctured. On completion of guide rail and buffer installation, both pit channels shall be fully grouted.

2.7.3.1 Pit "STOP" Switch

Provide push/pull type pit "STOP" switch for stopping elevator motor, independent of regular operating device. Locate switch on same side of hoistway as ladder.

2.8 CAR AND HOISTWAY DOOR ACCESSORIES

Provide infrared Curtain Unit (ICU) with multiple infrared beams that protect to the full height of the door opening. Minimum coverage shall extend from 50 mm (2 inches) off the floor to 1780 mm (70 inches) above floor level. Door operation must meet the requirements of ASME A17.1 Rule 211.3a(5) and 112.5.

2.9 GUIDES, FRAME, PLATFORM, AND ENCLOSURE (PASSENGER ELEVATOR)

2.9.1 Roller Guides

Comply with ASME A17.1, Section 200 and, where applicable, Section 301, Rule 301.1. Provide roller guide assemblies in adjustable mountings on each side of car in accurate alignment at top and bottom of car frame.

2.9.2 Car Door Operation

Semi-Selective or Full-Selective.

2.9.3 Car Enclosure

Comply with ASME A17.1, Section 204 and Rule 301.7. Provide stainless steel hooks with fire retardant pads. Carpeting shall comply with ASME A17.1, Rules 204.2 a.(2) and (4).

2.10 ELEVATOR HOISTWAY DOORS AND ENTRANCES (PASSENGER ELEVATOR)

Comply with ASME A17.1, Sections 110 and 112. Provide hoistway entrance assemblies, which have a minimum 1-1/2 hour fire rating.

2.10.1 Hoistway Entrance Frames

Provide 1.8 mm thick (14 gage) stainless steel or prefinished carbon sheet steel. Solidly grout uprights of entrances to a height of 1500 mm (5 feet).

2.10.2 Hoistway Entrance Sills

Provide one-piece cast solid nickel entrance sills. After sill is set level and flush with finished floor height, solidly grout under full length of sill.

2.10.3 Hoistway Ventilation

Provide hoistway ventilation directly to outside air by fixed louver through side wall of hoistway at highest possible point in hoistway. Net size of louver to be at least 3 1/2 percent of cross sectional area of hoistway.

2.11 GUIDE SHOES, PLATFORM, AND ENCLOSURE (FREIGHT ELEVATOR)

2.11.1 Car Gate

Comply with ASME A17.1, Rule 112. Provide power operated vertical rising gate.

2.12 CAR AND HOISTWAY DOORS AND ENTRANCES (FREIGHT ELEVATOR)

Comply with ASME A17.1, Sections 110, 111, and, where applicable 300. Provide hoistway entrance with complete door assembly including door panels with vision panel and truckable sill, frames, guide rails, and accessories. Provide hoistway entrance assemblies which have a minimum 1-1/2 hour fire rating.

2.13 PROVISION FOR HANDICAPPED

Comply with ATBCB ADA TITLE III, Sections 4.10 for Elevators, 4.30 for Signage, and 4.31 for Telephones.

2.14 PROVISIONS FOR EARTHQUAKE PROTECTION

Comply with all ASME A17.1, Part XXIV and TI 809-04, “SEISMIC DESIGN FOR BUILDINGS”, requirements.

2.15 EMERGENCY POWER OPERATION

Upon outage of normal power and initiation of emergency power, provide circuitry and wiring to operate elevator, telephone and intercom and to accomplish operation sequences. In multiple elevator systems, one elevator shall travel automatically to main floor, open doors, and shut down. Thereafter, each other elevator in the group (one at a time) shall return automatically to main floor. After all cars have returned to main floor, automatically provide one passenger and/or freight car in regular service. For single elevator systems, elevator shall travel automatically to the main floor, open doors, and automatically places itself in regular service. For emergency power operation, provide sign reading "EMERGENCY POWER" flashing in each car station. At same time, provide operable Firefighters Service.

2.16 INSTALLATION

Install Elevator in accordance with manufacture’s instructions, ASME A17.1, ATBCB ADA TITLE III, and NFPA 70. Do not allow abrupt bending of traveling cables. Do not cut or alter Structural Members. Restore any damaged or defaced work to original condition. Include recesses, cutouts, slots, holes, patching, grouting, and refinishing to accommodate elevator installation. Use core drilling to drill all new holes in concrete. Finish work shall be straight, level, and plumb. During installation, protect machinery and equipment from dirt, water, or mechanical damage. At completion, clean all work, and spot paint.

2.17 FIELD QUALITY CONTROL

Contractor shall perform all required tests and demonstrate proper operation of each elevator system and prove that each system complies with contract requirements and ASME A17.1, Section 01006, "Acceptance Inspection and Tests of Passenger and Freight Hydraulic Elevators", and the applicable requirements of Part XI, "Engineering and Type Tests". Inspection procedures in ASME/ANSI A17.2.1 or A17.2.2 form a part of this inspection and acceptance testing. All testing and inspections shall be

conducted in the presence of the elevator inspector. Demonstrate the proper operation of all equipment at various date settings, selected by the elevator inspector, ranging from the date of contract award through 1 January 2099.

Inspector shall complete, sign and post form NAVFACENGCOM 9-11014/33 (Rev. 7-88), Elevator Inspection Certificate, after successful completion of inspection and testing.

2.18 TESTING MATERIALS AND INSTRUMENTS

Furnish testing materials and instruments required for final inspection. Include calibrated test weights, tachometer, 600-volt megohm meter, volt meter and ammeter, three Celsius calibrated thermometers, door pressure gage, spirit level, stop watch, dynamometer, and 30 meter (100 foot) tape measure.

2.19 FIELD TESTS

2.19.1 Endurance Tests

Test each elevator for a period of one hour continuous running, with specified rated load in car. Restart the one-hour test period from beginning, following any shutdown or failure. During test run, stop car at each floor in both directions of travel for a standing period of 10 seconds per floor. The requirements for Rated Speed, Leveling, Temperature Rise and Motor Amperes Test specified herein are to be met throughout the duration of the Endurance Test.

2.19.2 Speed Tests

Determine actual speed of each elevator in both directions of travel with rated load and with no load in elevator car. Make Speed tests before and immediately after endurance test. Determine speed by tachometer reading, excluding accelerating and slow-down zones per ASME/ANSI A17.2.1. Minimum acceptable elevator speed is the rated speed specified. Maximum acceptable elevator speed is 110 percent of rated speed.

2.19.3 Leveling Tests

Test elevator car leveling devices for landing accuracy of plus or minus 6 mm (1/4 inch) at each floor with no load in car, symmetrical load in car, and with rated load in car in both directions of travel. Determine accuracy of floor leveling both before and immediately after endurance tests. For Class C2 landing, freight elevators shall comply with ASME A17.1, Rules 207.2b (3)(a), (b) and (c). The maximum load on car platform during loading or unloading shall not exceed 150 percent of rated load.

2.19.4 Insulation Resistance Tests

Perform tests to ensure elevator wiring systems are free from short circuits and grounds. Minimum acceptable insulation resistance for electrical conductors is one megohm between each conductor and ground and between each conductor and other conductors. Prior to megohm meter test, make provisions to prevent damage to electronic devices.

2.19.5 Temperature Rise Tests

Determine temperature rise of elevator hoisting motor, motor-generator, exciter, and booster during full-load test run for one hour minimum. Under these conditions, maximum acceptable temperature rise shall not exceed acceptable temperature rise indicated on manufacturer's data plate. Start test only when equipment is within 5 degrees C of ambient temperature.

2.19.6 Balance Tests

Perform electrical and mechanical balance tests of car and counterweight.

2.19.7 Motor Ampere Tests

Measure and record motor amperage when motor is running and elevator is lifting at rated load and speed. Measure and record motor amperage at beginning and end of endurance test.

2.20 MAINTENANCE SERVICE TRAINING

Provide qualified representative of elevator manufacturer to instruct Government personnel in care, adjustment, and maintenance of elevator equipment for a period of not less than 5 working days immediately following acceptance of elevator system.

END OF SECTION